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1976-10

# Forest Insect and Disease Management

5230
BIOLOGICAL
EVALUATION R2-76-10

MOUNTAIN PINE BEETLE

Shoshone National Forest
Bureau of Land Management
State and Private Land
South Pass City &
Atlantic City, Wyoming

NOVEMBER 1976

## Rocky Mountain Region

U.S. Department of Agriculture Forest Service

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## INTRODUCTION

The mountain pine beetle has been infesting lodgepole and limber pine in the Rock and Beaver Creek drainages near Atlantic City, Wyoming, for the past 12 years. In October Vernon Creasap, Entomologist, and Craig Halbower, Biological Technician, conducted a ground survey of the infestation. Three one-chain wide by 100-chain long cruise strips were run to collect build-up ratio and stand composition data. The purpose of this evaluation is to provide a current assessment of the infestation. Much interest and concern has been expressed by public land managers, private landowners and various public segments for some type of corrective activity. A large timber sale involving state, private, Bureau of Land Management and Forest Service lands was awarded that will harvest infested and green trees over the next several years.

## TECHNICAL INFORMATION

Causal Agent: *Dendroctonus ponderosae* Hopk., mountain pine beetle.

Hosts: *Pinus contorta* var. *latifolia* Dougl., lodgepole pine; *P. flexilis* James, limber pine.

Location of outbreak: The outbreak is located on the southeastern end of the Wind River Mountain range near the historic mining towns of South Pass City, Atlantic City and Miner's Delight (ghost town), in Wyoming. The beetles are causing tree mortality on lands of private ownership and Federal lands administered by the Bureau of Land Management and the Forest Service.

Type of Damage: Tree killing varies from small groups of a few trees, to large groups. In some stands most of the trees 8" dbh and larger have been killed (Tables 3 and 4). Dwarf mistletoe (*Arceuthobium americanum* Nutt. ex Engelm.) and Comandra blister rust (*Cronartium comandrae* Pk.) are also present in the area (Tables 2 and 4).

Life History: The mountain pine beetle has one generation per year. Adults attack trees from July through August by boring through the bark to the cambium. The females then tunnel upward for 12 to 30 inches (these tunnels are called egg galleries). The females lay eggs in individual niches along each side of the gallery which is then packed with frass. After hatching, the larvae feed in individual channels (larval galleries) at right angles to the egg gallery in the phloem. The insect overwinters

in the larval stage. In the spring, when the larvae are fully developed, they excavate an oval chamber (pupal chamber) at the end of the larval gallery and pupate. Finally, mature adults emerge from the chamber by boring through the outer bark and fly to attack new trees, completing the generation.

Stand data: A survey was conducted by personnel from the Forest Service. One-chain wide and one-hundred chain long strips were run to obtain a ratio of 1975- to 1976-infested trees. Every five chains, variable point plots were taken to obtain stand composition data. Data were taken to include a measure of the incidence of mountain pine beetle infested trees, and those infected with Comandra rust and dwarf mistletoe.

## RESULTS

There appear to be over 125,000 currently infested trees on about 8500 acres, compared to 100,000 trees on about 5700 acres in 1975. Timber stand tables (see Tables 1 and 4) show the effects of mountain pine beetle, Comandra rust and dwarf mistletoe for the area. The mountain pine beetle build-up ratio is one 1975 infested tree to 4.20 1976 infested trees. This is biased since the plots were taken in areas into which the mountain pine beetle is expanding. At present, there are about 1200 acres of infested timber beyond the boundaries of the cooperative timber sale. Dwarf mistletoe ranges from light infections to pockets of heavily infested trees. Comandra rust infected trees are scattered throughout the area.

Table 1 shows that the average basal area is being reduced from 127.5 sq ft/acre to 85.9 sq ft/acre. Maximum basal area per acre ranges from 190 to 250 sq ft/acre per line. Table 2 summarizes the strip cruise data. It shows an average of 14.5 green infested trees per acre in newly infested areas, and a build-up ratio of 1:4.20 in areas into which the beetle is moving. Table 3 shows the average dbh of the stand before beetle attack and the residual stand. Table 4 shows general stand composition and percent mortality from mountain pine beetle, Comandra blister rust, mistletoe and environmental factors (suppression, weather, etc.). Over one-third of the sampled trees were larger than 8" dbh before beetle attack. After beetle attack, the number of trees over 8" dbh had been reduced to about one-fourth of the stand. Remaining uninfested stands still have a high percentage of trees larger than 8" dbh.

## DISCUSSION

Mountain pine beetle has been very active in large lodgepole pine sawtimber type stands and will continue in these stands. Smaller lodgepole pine sawtimber type stands will suffer less loss from mountain pine beetle. Amman and others (1) found lodgepole pine epidemics diminish in intensity with an increase in elevation. The mountain pine beetle should continue to be very active in larger diameter stands at lower elevations.

Mountain pine beetle outbreaks occur in stands of large diameter trees with thick phloem. Cole (2) stated that "the relation of phloem depth to tree diameter is highly variable, most trees having thick phloem are large diameter; conversely, trees having thin phloem usually are small diameter." Mountain pine beetle outbreaks in lodgepole pine must have larger diameters (11" and above) to sustain an epidemic (3). Cole (2) shows that the relationship of beetle production to diameter classes. For example: An 8 to 9 inch dbh tree would produce one-third enough beetles to infest and kill a 12-inch dbh tree.

The most effective method of suppressing the mountain pine beetle is through a combined program of logging infested trees and timely silvicultural treatment to remove or reduce the inventory of large diameter, highly susceptible trees (4). Suppression efforts should not rely entirely on salvage logging of infested trees, since epidemic potential remains as long as there is a high inventory of large diameter lodgepole pine. The beetles usually are epidemic in a stand until the average diameter of the stand is reduced below 8 inches. Reduction of the inventory of larger diameter, susceptible trees can provide conditions to improve the growth of smaller diameter crop trees. Removal of dwarf mistletoe and Comandra rust infected trees is also a good forestry practice. Based on data from this year's build-up ratio cruises it is expected that mountain pine beetle losses will continue to rise compared to 1975 losses.

Presently there is a 40 mm bf cooperative timber sale covering most of the mountain pine beetle outbreak. However, the infestation has spread to approximately 1200 acres outside of the timber sale.

## RECOMMENDATIONS

Present efforts on the existing timber sale should be continued. Salvaging currently infested timber and reducing the average dbh of the residual stand is imperative to control of the mountain pine beetle. Since the infestation has spread beyond the timber sale area, plans for adjacent timber sales should be made.

REFERENCES CITED

1. AMMAN, G. D., B. H. BAKER, and L. E. STIPE. 1973. Lodgepole pine losses to mountain pine beetle related to elevation. USDA, Forest Service. Res. Note Int-171. 8 pp.

2. COLE, W. E. 1973. Interaction between mountain pine beetle and dynamics of lodgepole pine stands. USDA, Forest Service. Res. Note Int-170. 6 pp.

3. COLE, W. E. and G. D. AMMAN. 1969. Mountain pine beetle infestations in relation to lodgepole pine diameters. USDA, Forest Service. Res. Note Int-96. 7 pp.

4. AMMAN, G. D., M. D. McGREGOR, D. B. CAHILL, and W. H. KLEIN. Guidelines for reducing losses of lodgepole pine to the mountain pine beetle in the central and northern Rocky Mountains. First Draft. USDA, Forest Service.

TABLE 1

BASAL AREA SUMMARY

| Area | Number Plots | Total Number Trees | Number Live Trees | Total BA per Acre | Residual BA per Acre |
|---|---|---|---|---|---|
| | | | ALL SPECIES | | |
| Beaver Creek | 18 | 264 | 232 | 146.7 (10 - 200) | 128.9 (10 - 190) |
| Mill Pond | 6 | 100 | 21 | 166.7 (10 - 210) | 35.0 (10 - 50) |
| Rock Creek Reservoir | 20 | 211 | 161 | 105.5 (10 - 250) | 80.5 (10 - 230) |
| Snow Creek | 20 | 241 | 136 | 120.5 (10 - 190) | 68.0 (10 - 140) |
| TOTAL | 64 | 816 | 550 | | |
| AVERAGE | | | | 127.5 | 85.9 |

TABLE 2

STRIP CRUISE SUMMARY

| Area | Acres | 1976 Infested Lodgepole Pine | 1976 Infested Limber Pine | 1976 Infested Lodgepole Pine per Acre | 1976 Infested Limber Pine per Acre | 1975 [1] Infested Lodgepole Pine | 1975 [1] Infested Lodgepole Pine per Acre | Comandra Blister Mortality per acre | Mistletoe Mortality per Acre | Build-up Ratio 75 : 76 |
|---|---|---|---|---|---|---|---|---|---|---|
| Beaver Creek | 9.5 | 126 | -- | 13.26 | -- | 19 | 2.00 | 0.42 | -- | 1 : 6.63 |
| Rock Creek Reservoir | 9.5 | 62 | 8 | 6.53 | 0.84 | 22 | 2.32 | 0.11 | 0.52 | 1 : 3.18 |
| Snow Creek | 9.5 | 227 | 1 | 23.89 | 0.11 | 60 | 6.32 | 0.21 | -- | 1 : 3.80 |
| TOTAL | 28.5 | 415 | 9 | | | 101 | | | | |
| AVERAGE | | | | 14.56 | 0.32 | | 3.54 | 0.25 | 0.18 | 1 : 4.20 |

[1] No 1975 limber pine mortality found on survey lines

TABLE 3

AVERAGE DBH SUMMARY

| Area | Total Stand | | | Residual Stand | | | | 1976 Mortality | | 1975 [1] Mortality | Other Mortality | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All Species | Lodgepole Pine | Limber Pine | All Species | Lodgepole Pine | Limber Pine | Aspen | Lodgepole Pine | Limber Pine | Lodgepole Pine | Mistletoe | Comandra Rust | Environmental |
| Beaver Creek | 7.20 | 7.23 | -- | 7.04 | 7.05 | -- | 7.02 | 9.17 | -- | 13.00 | --- | 7.05 | --- |
| Mill Pond | 9.20 | 7.41 | -- | 9.28 | 7.47 | -- | 6.64 | 9.20 | -- | 11.05 | --- | -- | --- |
| Rock Creek Reservoir | 8.52 | 8.62 | 7.88 | 8.02 | 8.06 | 7.75 | 10.00 | 9.69 | 8.19 | 12.21 | 10.55 | 6.30 | 11.32 |
| Snow Creek | 8.93 | 9.21 | 7.21 | 8.01 | 8.28 | 7.21 | 6.39 | 10.74 | -- | 11.23 | --- | 9.45 | --- |
| AVERAGE | 8.14 | 8.29 | 7.80 | 7.52 | 7.60 | 7.70 | 6.89 | 10.02 | 8.19 | 11.23 | 10.55 | 7.44 | 11.32 |

[1] No 1975 limber pine mortality found on survey lines

TABLE 4

STAND COMPOSITION SUMMARY

| Area | Total Stand | | | Residual Stand | | | Mortality MPB | | Mortality - other | | | Trees over 8" DBH | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lodgepole Pine | Limber Pine | Aspen | Lodgepole Pine | Limber Pine | Aspen | Lodgepole Pine | Limber Pine | Mistletoe | Comandra Rust | Environmental 1/ | Total | Residual |
| | PERCENT | | | | | | | | | | | | |
| Beaver Creek | 84.24 | ----- | 15.76 | 82.75 | ----- | 17.25 | 8.34 | ---- | ---- | 1.95 | ---- | 17.91 | 15.64 |
| Mill Pond | 97.06 | ----- | 2.94 | 86.67 | ----- | 10.33 | 68.80 | ---- | ---- | ---- | ---- | 64.11 | 24.69 |
| Rock Creek Reservoir | 85.71 | 13.91 | 0.38 | 84.00 | 15.54 | 0.46 | 15.90 | 8.81 | 1.97 | 1.00 | 2.11 | 41.47 | 33.23 |
| Snow Creek | 89.71 | 1.24 | 9.05 | 85.05 | 1.82 | 13.13 | 34.71 | ---- | ---- | 0.80 | ---- | 50.11 | 33.07 |
| AVERAGE | 87.18 | 3.60 | 9.22 | 83.87 | 4.26 | 11.87 | 23.52 | 8.05 | 0.46 | 1.12 | 0.49 | 36.10 | 24.25 |

1/ Environmental Mortality includes suppression, weather and other factors besides insects and diseases.

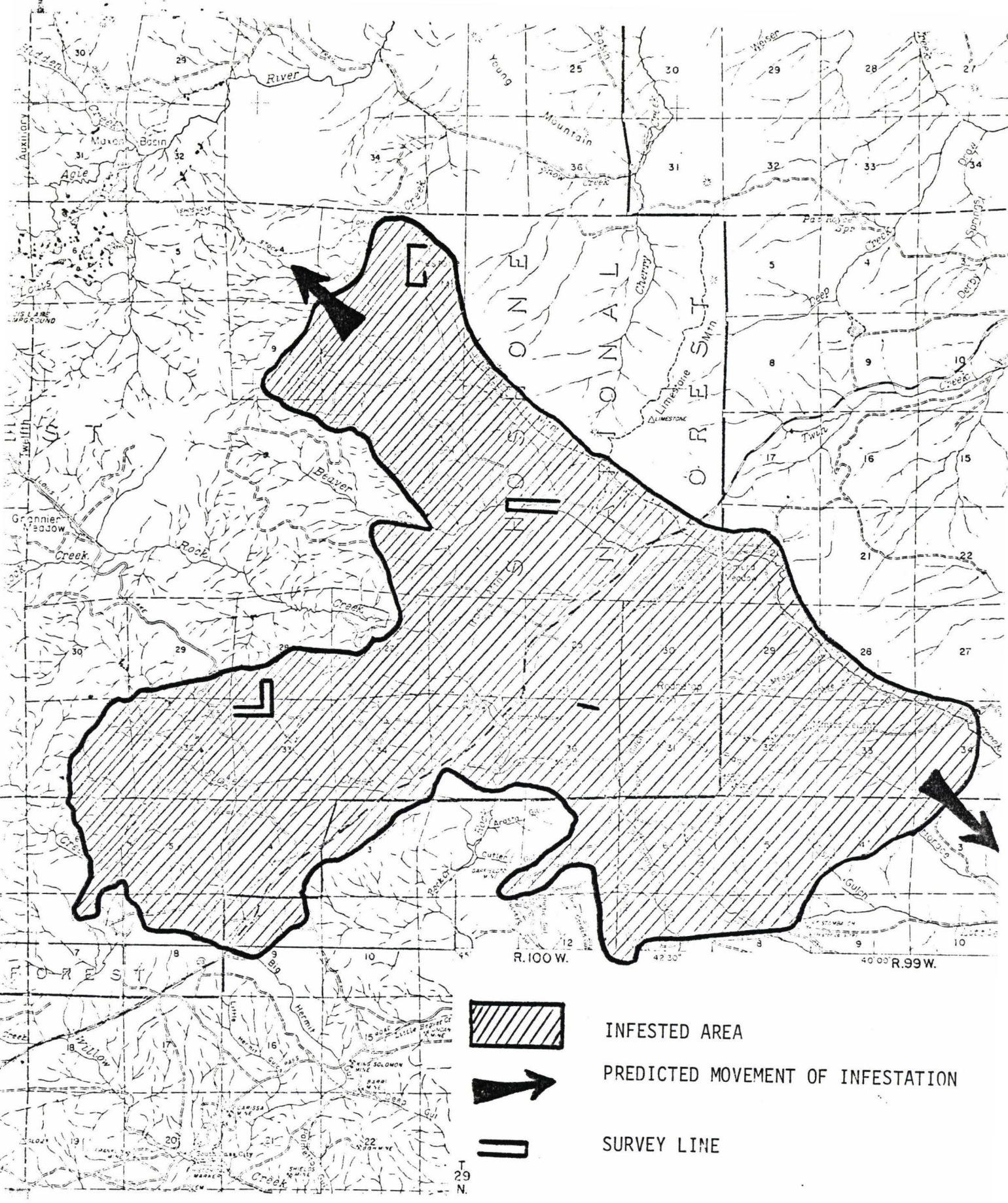
INFESTED AREA
PREDICTED MOVEMENT OF INFESTATION
SURVEY LINE
R. 100 W.
R. 99 W.
T. 29 N.

Figure 1